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Revised American Patent Law

The American Senate has before it a proposition in Bills Nos. 4191 and 2303 to establish the principle of automatic licensing of all inventions, whereby any corporation or government, even in peace times, is enabled to manufacture and sell the patented device upon the agreement to pay established licence fees. The Editor of the "Iron Age" has assailed the notion in good round terms. He obviously knows American conditions better than we, but it seems curious that almost everything he says is diametrically opposed to our conceptions of the recent past functioning of the patent system. Primarily he envisages great injustice being done to "the little fellow," should these Bills become law, as it would reinforce the strength of the great existing manufacturing firms. In many industrial fields it is just not worth while taking out Letters Patent by the "little fellow," as it is a routine matter for large combines to oppose in the courts every patent entering their particular field, and the costs involved are insupportable by the "little fellow." The next statement which interests us is that the "founders of our patent system were thinking of establishing a way in which little businesses could be protected during their formative periods so that these little businesses could have a chance to grow larger and thus strengthen our industrial fabric." That may be so, yet probably the American system, which so strongly resembles our own, was modelled from the British. This in turn has been an outgrowth from the time when the King granted patents or monopolies to people who had rendered him some service, that person not necessarily being the inventor. The early patent laws were designed to transfer this right to the State and allow inventions to pass from private ownership, after a limited period of years, into what the French aptly describe as the "domaine publique." Apparently, the proposed American law reimburses the inventor on the basis of public demand in the invention for, we presume, a limited number of years. This seems to us to be fair and democratic. The only possible objection we can see is well summed up in the statement that "under the proposed revision of our patent laws, research and development of ideas would be seriously handicapped." One competitor, for example, could wait for another to spend thousands of dollars and months of time in perfecting an idea to the point of marketability, and then demand a licence to manufacture and compete. Under such circumstances, big money concerns would have all the advantages over their competitors. Yet against this, the inventing concerns would receive money which would enable them to keep in business and use the royalties so obtained to reduce their selling price. To be quite candid, the proposed changes in the American system appeal to us as being a step forward in the right direction, as we feel they would help the "little fellow" to get a square deal, for in truth, a poor invention in the hands of good business finds its place more quickly and efficiently in the industrial machine than a good patent in the hands of one lacking commercial acumen. Moreover, it provides a ready-made solution to the problem of patents taken out in the name of such bodies as the British Cast Iron Research Association.

An inter-Allied development of immediate importance to the common war effort is the arrangement just made between the British and United States Governments concerning the interchange of patent rights and information, for the purposes of, and until, the termination of the war. This welcome agreement will smooth over many difficulties and place the fruits of inventive genius at the disposal of the two principal industrialised members of the United Nations.

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CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

SKELETON PATTERNS

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—The description on "Skeleton Patterns," by "Checker," in your issue of September 10, aroused my interest considerably, but I suggest that there is yet a cheaper method of producing both these patterns

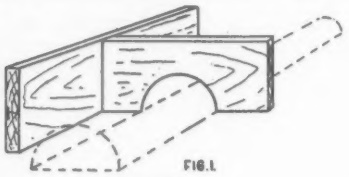

FIG. 1.

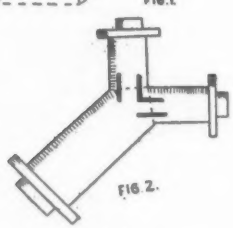

FIG. 2.

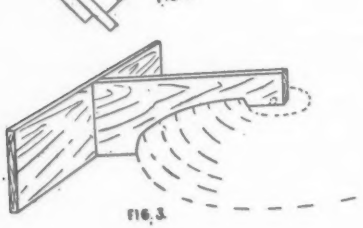

FIG. 3.

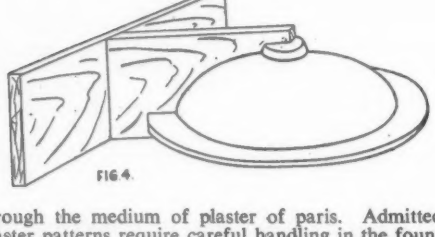

FIG. 4.

through the medium of plaster of paris. Admittedly, plaster patterns require careful handling in the foundry—so do numerous dried sand cores—and the fact that plaster patterns up to 5 ft. and 6 ft. long by 3 ft. or 4 ft. by 12 in. are being regularly made in my department proves the foundry can adapt itself to a new technique. The method of producing these two patterns in plaster is as follows:—

For the branch pipe two half templates would be "struck," according to the diameters of the main and branch pipes, as shown in Fig. 1. Two lengths of half-section pipes are then "run" in plaster. When cut to required lengths, the three pieces are assembled to lines set out on a board, and joined together by grouting in 4-in. nails (Fig. 2). Core-prints are made in the same way and the flanges "struck" on similar lines to the cover shown below.

This cover is a simple straightforward turning. Again two templates are made, one to the inner contour and the other to the outer, Figs. 3 and 4. Using the smaller strickle, a "saddle" is "struck up" in plaster, which, when set, is shellaced and greased. Over this saddle is placed the longer template, using the same centre pins, and this is also turned in plaster. When "set," the cover may be lifted off the saddle with ease. For a pattern like this of 24 in. dia., 6 hrs. would cover time spent in making both strickles and pattern, which would serve for at least six castings. The saddle would serve as a support while the outside is being rammed. It would be interesting to know what time was spent on this skeleton pattern by "Checker," and one could then arrive at the comparative costs.

"Checker" may be interested to know that I am giving a practical demonstration at Cardiff on October 17, and propose running up a cover as described.—Yours, etc.,

H. PLUCKNETT.

"Ingleside," Nags Head Hill,
St. George, Bristol, 5.
September 17, 1942.

NOTES FROM THE BRANCHES

EAST MIDLANDS

The Branch opened its winter session on September 19. It took the form of a joint meeting with the Lincoln Section and the Newark Engineering Society, and was held at Newark. In the afternoon, by kind invitation of the directors, the members visited the works of Worthington Simpson, Limited, Newark; this visit was greatly appreciated and enjoyed by all attending. In the evening a meeting was held at the Newark Technical College.

Mr. H. J. Beck, Immediate Past-President, introducing Mr. G. L. Harbach, Branch-President, said how much he had enjoyed his year of office and how deeply he appreciated the loyal support of all members and the assistance he had received from the Branch Council. He could assure Mr. Harbach that support in like manner would be given to him and he concluded by wishing Mr. Harbach a most successful and happy year of office. Mr. Harbach suitably replied.

Following the presidential address, which is printed elsewhere in this issue, a Paper entitled "Bakelite Plastics," by Mr. R. D. Roberts and Mr. W. Bowman, was presented and discussed.

LOW-TIN AND TIN-FREE BRONZES AND BRASSES

By MEMBERS OF THE NON-FERROUS SUB-COMMITTEE OF THE TECHNICAL COMMITTEE

Discussion of Reports at June Annual Meeting of the Institute of British Foundrymen in London

(*Continued from page* 100.)

New Types Favoured by Admiralty

MR. C. COLDRON-SMITH (Admiralty) said it would be ungracious for him to attempt any criticism of the Report, considering the extent to which the Admiralty had used the information contained in it. In the first place, he wished to convey to the members of the Sub-Committee, and to the other gentlemen who had so kindly helped, the thanks of the Engineer-in-Chief on behalf of the Admiralty. Their assistance had been very greatly appreciated, particularly when it was remembered that much past Admiralty experience had been with the 88/10/2 alloy. The Admiralty had been confronted, of course, with considerations of the problems of production and of service; so that it was only too grateful to accept the offer of assistance from the Institute. He hoped that the information contained in the Report would be given very wide publicity, not only among foundrymen, but also among designers; the data which Mr. Hudson had assembled in Part II of the Report particularly should be brought to their immediate notice by all possible means.

Contractors to the Admiralty would be receiving a letter shortly to indicate how the specifications were to be applied. The Admiralty scheme followed very much the lines laid down in Table V (suggested applications of gunmetals and cast brasses) in Part II of the Report, and as outlined in the foreword of B.S.S. 1021/28. The aim was to make the 86/7/5/2 alloy the standard for Admiralty purposes, using the 88/8/4 or the 88/10/2 alloys when the 86/7/5/2 was not obtainable or where Service conditions demanded their use. It was not foreseen that they could make very much use of the 85/5/5/5 material, and it was thought better, for the sake of foundry organisation, to try to restrict the main alloy to the 86/7/5/2 type.

Concluding on a note of warning, Mr. Coldron-Smith said it was found, when the first attempts were made to debase the gunmetals by the use of B.S.S. 900/1 alloy, that certain naive people were actually adding lead to virgin metals. It was hoped that, in the preparation or the use of the 86/7/5/2 alloy, that sort of thing would not occur. Whilst appreciating that probably the temptation was rather great—because he was informed that the alloy was cheaper to make in virgin metal than from scrap—he stressed that, in view of the need for economy, that sort of thing really must come to an end.

Maximum Tensiles Too High?

MR. E. J. L. HOWARD (Mather & Platt, Limited), emphasising some of the points made by Mr. Bailey, said that it was advisable in certain cases not to depart from the use of alloys such as the 88/10/2 or, at least, to use alloys which were lead-free. One particular application he mentioned was the making of slip rings for rotary converters; ½ per cent. of lead in Admiralty gunmetal used in such high-speed machines led to the wearing of the rings in such a way as to reduce considerably the efficiency of the machines.

Commenting on Mr. Murphy's reminder that the type B brass was not new, he said he believed the main objection to such alloys in the foundry had been that the fumes they produced gave rise to unhealthy conditions. However, that objection had been overcome largely by the application of modern means of ventilation.

Apologising for the brief note he had made in the Report with regard to test casts, and the results obtained, Mr. Howard said that if more time had been available the work put in would have been of more value; the castings made were of only 5 to 6 lbs. weight, and he appreciated that in attempting to make larger castings, such as that made by Mr. Arnott, trouble might have been experienced, particularly where the copper content was low. Where such trouble occurred he would take strong measures immediately and would increase the copper content to about 66 per cent., for there was danger in getting down to the β structure.

Although the minimum tensile figure he had given was about 14 tons per sq. in., he felt that the specification of 14 tons was rather on the high side, and that to stipulate 12 tons for the α type and 14 tons for the β type was not altogether right. It would have been better to have stipulated 11 tons per sq. in. for both brasses. This would give a fair margin in the foundry.

When to Use Charcoal

MR. R. F. HUDSON (Phosphor Bronze Company), referring to the silicon bronzes, said that for Everdur he always used an oxidising atmosphere, for difficulty had been experienced when using a reducing atmosphere. Commenting on the use of charcoal as a cover for P.M.G., he said that if an oxidising atmosphere were used it might be satisfactory, but with a reducing atmosphere, when using charcoal, trouble would possibly arise. Referring again to Everdur, he said that if he had a reducing atmosphere in the furnace he would use an oxidising slag.

Referring to chills, he said that he had cast a large quantity, mainly in phosphor bronze, but also in gunmetal and Everdur, and had found that solid bars in Everdur and gunmetal had a definite tendency to porosity, owing to the short freezing range. Only

Low-Tin and Tin-Free Bronzes and Brasses

when the best technique was employed was he able to obtain good castings, and even then some porosity could still be seen by the aid of the microscope.

Commenting on Dr. Alexander's tests, he asked what shape of test-bar he had used for Everdur, and whether he had tried the U.S. Navy bar, made with two small ingates and the heavy riser above.

Dealing with the experiments on the new brasses, in which castings weighing up to 4 and 5 cwts. had been made, he said the first of those castings were made free of aluminium. The second, which contained 0.1 per cent. aluminium, was a very bad casting, the shrinkage being much greater than when there was no aluminium present. The castings made with Everdur were very good, giving no trouble at all.

With regard to Table V, a suggested application for the 86/7/5/2 alloy was the making of slip rings for electrical equipment. He wondered whether 96 per cent. copper and 4 per cent. nickel would prove to be a more suitable alloy for that purpose.

The Case for Low Tin Bronzes

MR. F. DUNLEAVY was pleased that the trend of the discussion so far appeared to be to support the lower-tin-content gunmetals against the silicon bronzes. Emphasising the difficulties which would be experienced by what he called the "backyard or back-street foundryman" if a change were made at once to the use of the silicon bronzes, he said their numbers were legion and they were making pressure castings for the Admiralty; how, he asked, could they be expected to make those castings in a new material without experiencing considerable difficulty? The far better course was to make those castings in the low-tin bronzes similar to the types already in use, and to make them sound, rather than to make them in silicon bronze and then to re-make them before they could be regarded as satisfactory. At a recent meeting in Manchester the problem of the contamination of silicon bronze by tin and tin bronzes was discussed. The suggestion was made that there should be a separate foundry for each class of material; but surely that was not possible. There must be something reasonable; and, in supporting the suggestions of the Non-Ferrous Sub-Committee, he felt sure that foundrymen were at last getting down to real business. The average foundryman, he said, would make castings in silicon bronzes, P.M.G. or any other material, provided he had some assistance from the metallurgical side; if he had not that assistance, he would not be successful. He must know the material he is using, and also the control of the composition, back scrap and machine-shop return. There were more of the "backyard" foundries than of others, and it was necessary to consider them; otherwise, they would be pushed out of business, and the country would lose the benefit of the experience of many men who were doing a satisfactory job, contributing to the war effort.

After complimenting Mr. Hudson on a very fine effort, Mr. Dunleavy asked for the feeling of the meeting with regard to the lower-tin bronzes versus the silicon-bronzes; he would like to know the views and experiences of others in connection with the use of those materials.

Reaching the Designer

MR. A. LOGAN did not think it was necessary for him at that stage to offer any criticisms on the technical aspects of the Report; but he welcomed it as a very excellent piece of work, which provided excellent guidance for the practical foundryman. A consideration which rather worried him, however, was that, whereas at the present stage the Report would be circulated to foundrymen, who were, one might say, already converted, it ought to be distributed also to those who were concerned with design and specification. It was admitted, he said, that foundrymen were anxious and willing to play their part by utilising the low-tin bronzes as far as possible, and thus assist in the conservation of tin. In very few cases, however, had the foundrymen any say on matters of design and specification. It was necessary that the test results and the recommendations published in the Report should be brought to the attention of those who specified the materials of which castings were to be made; and in the majority of cases that started in the design room or drawing office. It was quite possible that, if the information given and the recommendations made in the Report were merely allowed to filter through, much valuable time might be lost and much tin would be used which otherwise might be saved. In order to direct attention to the Report, he suggested that an official letter from the Admiralty might be sent to the firms who were doing Admiralty work. There were, however, also many firms who were not doing Admiralty work and who might continue to use the high-tin alloys, whereas they would not do so if their attention were directed to the matter in a specific way quickly. He could not suggest exactly what should be done in respect of those firms, but he emphasised that some action needed to be taken, and taken quickly.

A Case in Point

MR. G. HYSLOP (Phosphor Bronze Company) supported Mr. Logan's plea that something definite should be done to draw the Report to the attention of those who authorised and specified the alloys that were used; he pointed out that the jobbing foundry, for instance, had little or no control over the alloys specified by the customers. In that connection he mentioned a recent case in which an order was given for 12 tons of ingots in drawn phosphor-bronze mixture, for making castings. He had got into touch with the firm which had given the order, and had suggested that they should get into touch with the Government department concerned with a view to its specifying an alternative mixture. Instead of doing that, however, they had referred the matter back to the Control, who did not know the exact purpose for which the mixture was to be used. Ultimately the matter was referred back to the customer, and authority was given to use manganese bronze—which was evidence that the castings

could be made "in any darned thing at all." Thus, if only we could get at the designers and those who specified and who knew the facts—as, for instance, Mr. Coldron-Smith, who had been concerned with the tests as a representative of the Admiralty and who had had the benefit of the discussions throughout the work described in the Report—the industry should get results. However, Mr. Coldron-Smith represented only one section of the Admiralty, and others might not necessarily follow.

MR. COLDRON-SMITH said the other departments were following the example of his department.

MR. HYSLOP replied that he was glad to hear that; and he wished the War Office and the tank people would follow on the same lines. He had heard that something was to be done to get the designers together. Whilst acknowledging that the Non-Ferrous Metals Control had been extremely helpful, he said he believed Mr. Miller would be the first to admit that the Control relied largely on the honesty of foundrymen. They had not been let down by the foundrymen; but, on the other hand, he suggested that they were looking rather too much to the trade for guidance. They had asked that they should be informed of instances in which metal had been misapplied, so that they could take the necessary steps; but it was not possible to get inside all the foundries and to know exactly the uses to which the various materials were put.

AUTHORS' REPLIES

Part II of Report

MR. FRANK HUDSON, replying to the discussion on Part II of the Report, first expressed gratitude to Mr. Miller for having drawn attention to the facts relative to the mechanical properties of the types A and B brasses at elevated temperatures. He had had a considerable hunt, he said, for data on the subject, but could not find them, and he urged that there was room for quite useful work to assist the application of the specifications by assessing the properties of the two brasses at elevated temperatures. That work might very usefully be considered either by the Non-Ferrous Sub-Committee of the Institute, or alternatively by the British Non-Ferrous Metals Research Association. It would be very useful work and would not occupy very much time. He was glad the matter had been raised, because he was anxious to collect as much data as he could, and he had looked to the meeting to provide the missing pieces.

In reply to Mr. Bailey, he agreed fully, in regard to his remarks on the corrosion resistance of the brasses, that a statement emphasising the alpha structure was to be preferred to a definite assertion limiting the amount of zinc to 20 per cent., for that, rather than the zinc content, was the controlling factor.

Dealing with Mr. Murphy's comments on Mr. Arnott's experiment in making a casting in type B brass, Mr. Hudson said he had seen that casting and had discussed it with Mr. Arnott, who no doubt would say that it would probably have been accepted by the inspection authorities; the defects were not really bad enough to warrant scrapping it. But the inference to be gained from the test was that the normal gating methods employed when using gunmetal—and that particular casting was normally made in gunmetal—did not apply when it was made in type B brass; it was necessary to thicken up the ingates and risers and tend towards the manganese bronze type of technique in order to ensure that the casting would be entirely free from defects.

It was very interesting to hear Mr. Coldron-Smith's remarks on the action which the Admiralty were taking in connection with the use of the emergency alloys. He was, however, a little perturbed to learn that they were standardising on the 86/7/5/2 alloy, particularly if that statement applied to all the Admiralty Departments. For the Engineer-in-Chief's Department that alloy would be extremely useful; but for the Department of Naval Construction, for instance, one could think of castings which were used in large quantities—as, for instance, port-hole lights, of which very many must be needed for a big ship or even a small ship—and for which cast brass could be used. He hoped, therefore, that not all the Departments of the Admiralty were standardising on the 86/7/5/2 alloy; there was a very big field for the application of the cast brasses in the Admiralty, and he would like Mr. Coldron-Smith's assurance that he was not labouring under a misapprehension.

As to the use of the 88/10/2 gunmetal for rotary converter slip rings, no doubt Mr. Howard's statement was correct so far as rotary converters were concerned. But, said Mr. Hudson, in the course of some recent inquiries he had made in order to find out what were the best materials to use for certain purposes, he had approached the Morgan Crucible Company, who made large quantities of carbon brushes for electrical equipment (and the wear of brushes was closely associated with the type of alloy used in the slip ring), and they had assured him that for 90 per cent. of the slip rings required for motors in the electrical industry, the 86/7/5/2 alloy was entirely satisfactory. Indeed, they had gone so far as to state that one of the biggest electrical manufacturers in the country had standardised on that alloy for all the standard types of motors they produced. Therefore, he felt that, whilst the use of the 88/10/2 alloy might be necessary for rotary converters, it was by no means necessary for the majority of the slip rings used in the electrical industry.

That statement, he concluded, partly answered the question put by his brother, because the 86/7/5/2 alloy was more economical than the 96 per cent. copper, 4 per cent. nickel alloy, for the problem of the supply of nickel was also difficult, and the authorities were not anxious to recommend the use of that type of material for slip rings unless required for some special application in which the more common alloys could not be employed.

Low-Tin and Tin-Free Bronzes and Brasses

Parts I and III of Report

DR. HUNT, who welcomed Mr. Miller's remarks as a representative of the Non-Ferrous Metals Control, and acknowledged that he had played a part in the preparation of the Report, said the sense of the meeting was that the Control was assured of the co-operation of the non-ferrous foundries. Dr. Hunt underlined the advice that the foundries should experiment with the cast brasses, looking towards their substitution for the bronzes.

After commenting that the two apparent contradictions, concerning charcoal and lead, in the part of the Report dealing with the silicon bronzes had been reconciled by Dr. Alexander, he recalled Mr. Murphy's emphasis on the reasons why the well-known cast brasses had not been used in the foundries to a greater extent than in fact they had. The Sub-Committee did not wish to suggest in the Report, of course, that those cast brasses should be used by and large, and the warning given by Mr. Murphy was quite timely and worthy of consideration.

With regard to the point raised by Mr. Howard, that the tensile results obtained with the type B brass were only just above the figure of 14 tons per sq. in., and that the figure of 14 tons per sq. in. might be too high a figure to specify, he supposed the Non-Ferrous Sub-Committee could only refer the matter to the British Standards Institution for consideration and for such action as was necessary.

The important point raised by Mr. Dunleavy, that the smaller, less well controlled or uncontrolled foundry, trying to use silicon bronzes after having been accustomed to gunmetals, would run into trouble, had cropped up at the first meeting of the Non-Ferrous Sub-Committee. It was for that reason that the Committee had avoided any general recommendation to employ silicon bronzes in substitution for gunmetals in the general run of non-ferrous foundries. It was mentioned in the Foreword of B.S.S. 1021/28; and in the second paragraph of Part I of the Report it was stated that "although the silicon bronzes are capable of giving reliable castings of good mechanical properties, it is felt that difficulties might be experienced in foundries having no previous experience of these alloys." The aim of the Sub-Committee was merely to give some indication of the facts or some guidance to those firms who might consider themselves sufficiently well set up to be able to supply castings in the silicon bronzes. The same sense was contained in the foreword to B.S.S. 1021/28, where it was stated that "These alloys may with advantage be employed for special purposes if made by manufacturers having experience of such alloys." That being the view of the Sub-Committee on the matter, he was glad to hear Mr. Dunleavy's comments.

In reply to Mr. Logan and Mr. Hyslop, he said the Sub-Committee also were well aware that, in addressing foundrymen, they were talking to the converted, and that it was necessary to consider some means of bringing home the facts to Government Departments (apart from the Admiralty), and to all users who specified cast copper base alloys. Something would be done through the appropriate technical Press; it had not yet been done because the Report had been in print for only a few hours.

Finally, Dr. Hunt thanked the meeting for a very pleasing and interesting discussion of the Report.

Vote of Thanks

The CHAIRMAN (Mr. V. C. Faulkner) proposed a hearty vote of thanks to Dr. Hunt, Mr. Hudson, and all the members of the Non-Ferrous Sub-Committee and those who had assisted them, for having done such excellent work for the benefit of the industry and in the interests of the war effort. The publication of the Report was particularly pleasing because in some quarters, apparently, it was felt that the Non-Ferrous Sub-Committee was not pulling its weight. The Report, however, provided ample evidence that they had put their shoulders to the wheel; it was indeed a thoroughly worthwhile Report.

The vote of thanks was carried with acclamation, and the session closed.

EDUCATIONAL REFORM FROM AN INDUSTRIALIST'S VIEWPOINT

(*Concluded from page* 120.)

education, training and qualifications necessary in each different level, from operatives and clerks to executives. As it is doubtful if the teaching profession for a number of years could cope with the revolutionary changes envisaged by the proposed alterations, the national committees could tide over the gap by providing lecturers, capable of talking to children and able to put forward the industrial side from a wide and interesting angle. Such an arrangement would have advantages as a permanent institution.

The present system of selective training for each trade and profession binds us all in watertight compartments so that full co-operation is difficult, not only between different industries but in different departments of the same works. Given a series of industrial talks with stress laid upon the interdependence of all forms of industry for the national benefit, a child's outlook would be broadened and the desired co-operation in later life would be automatic.

The regional committees would have knowledge of local industries and their requirements and could organise works visits for the schoolchildren. They would also be in touch with the various national committees and, having copies of their publications, would be in a position to act as bureaux of information for their own localities, thus giving parents and teachers an authoritative body to consult on the choice of careers for children.

Only an outline of such a scheme can be given in the time allotted to a presidential address, but the author feels that he has voiced a common complaint and hopes that the suggestions offered may afford some guidance to those who are considering to-day the educational reforms of the future.

FILM-IMPACT PROCESS FOR CASTING METALS

Unique Process Applicable Successfully to Ferrous and Non-Ferrous Metals

By J. M. MERLE

"The Film-Impact Process for Casting Metals" is the subject of an article in "Steel" by J. M. MERLE, described as a metallurgical engineer of Chicago. The process appears to be unique and, it is claimed, operates successfully on both ferrous and non-ferrous metals. It is also stated that "two of the largest steel producers in Brazil are installing impact casting machines for operating steel."

In his introduction the author states that research has shown that if a stream of molten metal is placed in a supercooled condition before moulding, the resulting casting has a crystal structure and physical properties like a forging instead of the usual dendritic structure. By "supercooling" is meant cooling below the freezing point without solidification. A supercooled liquid is in a metastable condition and solidifies spontaneously when brought in contact with even a small particle of the solid phase or under a shock. Such a metal forms a casting in a mould like an ordinary melt but with a different and new structure, as a result of the removal of all the extra heat for handling and latent heat of fusion from the molten metal to place it in a supercooled state.

In 1933, two methods were developed to produce high-speed tool steel in the form of tools cast to shape as well as billets. Instead of having properties equal to competitive steel produced by forging and rolling, the impact-cast tools would cut faster or wear longer.

It was evident from the beginning that a mass of molten metal such as the content of a steel ladle could not be supercooled and then cast. It is difficult to pour this steel when left to cool under slag to a temperature only 25 deg. C. above its freezing point. Even then this cold molten steel fully contains all the latent heat of fusion which represents more than 75 per cent. of the heat to be dissipated to reach solidification and whose slow elimination is the main cause of ingotism and segregation in castings. The operation to be successful had to be continuous, fast and the supercooled metal immediately moulded. This led to the development of the film-forming method.

Processing and Working

The processing and working of the molten metal is effected as follows: A molten metal stream from a ladle is formed continuously and instantaneously into a thin film of controlled thickness by a moving, clean and dry metallic section which can be rotary disc, a metallic belt or the circular rim of a drum. The material, thickness, thermal conductivity and surface condition of this moving metal section have been selected to produce the fastest possible heat removal from the molten metal film. The length or periphery of this section has been designed to allow for the continuous and complete transfer of the heat to the air by radiation or to a liquid coolant.

The molten metal film adheres to and is carried by the selected moving metal section and loses heat rapidly by thermal conductivity without any oxidation or chemical contamination modifying its composition. As it loses heat the physical condition of the molten metal film changes and when it becomes supercooled it loses its adhesion to the moving metal section. The propelled metal film, as it becomes free, retains in its unsupported travel the direction and high velocity previously acquired and so is directed continuously to impact into a mould under its high velocity. For certain moulds, such as sand moulds, this high velocity is reduced by reshaping the film to the form of a supercooled stream before it reaches the mould. The extremely fast removal of heat from the molten metal film prevents the well-known selective segregation of metal components and it also liberates all gases contained before the supercooled film reaches the mould.

Removal of heat from the molten metal film is so fast that it is hard to visualise. By the addition of a small surfacing roll acting at the point where the molten metal reaches the supercooled state, films formed over the rim of a rotating drum can be collected in the form of solid continuous strips. Such strips of 0.040 to 0.004-in. thickness have been obtained at speeds of from 500 to 3,000 ft. per min. and with various metals, from lead to steel and alloy steel.

The film-impact process can be used for the production of most metal products in sand, metal and continuous moulds and for metal dies. As a result of the supercooling, degassing and propelling of the molten metal, the products moulded from it have a crystal structure, density and physical properties comparing favourably with forged and rolled products of the same composition. It is a direct process requiring simple machinery and little power and specially well adapted for large tonnage and mass production. It can be carried out in compact, completely integrated plants producing finished products, independent from other plants for supply of partly worked materials. This advantage is important in the present situation.

Essential Co-ordination

Industrial use of the film-impact process requires co-ordination between the three following elements: (1) Source and supply of molten metal; (2) impact-casting machinery; (3) moulding equipment.

Impact-casting machinery is entirely new equipment. Basically it is an apparatus for large and continuous operation, designed to handle from a few pounds to 3 tons of molten metal per minute. The machine is intrinsically a heat transfer and propelling unit.

Film-Impact Process of Casting

While a general design is applicable to most productions, the size and width of the film-forming cylinders as well as the composition and thickness of the materials used are governed by the thermo-conductivity of the molten metals or alloys handled. The film velocity is affected by the volume of molten metal to be handled per minute and also by the nature and shape of the castings to be produced. In certain cases, rotary moulds are necessary properly to form bimetallic products. For a limited production of small castings, the simpler and cheaper film-forming disc can be used to advantage.

The moulding equipment is determined by the number, size or shape of products to be made.

Ingots of all metals can be cast. These ingots come with a uniform structure right to the top, and free of defects. The full weight of the ingots can be turned into rolled products, thus eliminating a loss

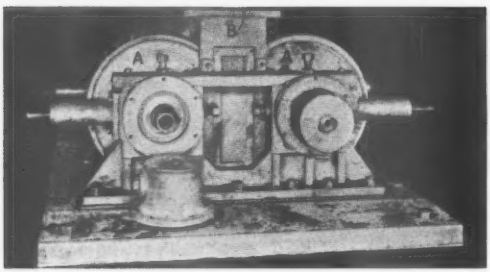

FIG. 1.—FRONT VIEW OF 7,000 LBS. PER MIN. FILM-IMPACT CASTING MACHINE. ROLLS ARE MARKED A AND THE TOP FUNNEL B.

of about 30 per cent. in sinkheads. In casting ingots, an impact-casting machine is interposed between the ladle and the ingot mould. The regular stream of molten steel from the ladle nozzle is poured into the machine which transforms it into a supercooled film and directs it into the mould until the mould is filled. After the stopper of the ladle interrupts the stream of molten steel, the next mould is registered under the machine and next pouring operation started, the same as pouring ingots directly from the ladle.

Instead of making ingots of standard sizes which require many rolling operations to be transformed into commercial products of desired sizes and shapes. the impact-casting process can be used to produce these commercial products directly to finished sizes and shapes or ready to be finished by cold rolling or drawing. The equipment required in that case is as follows: An impact-casting machine directing the film of supercooled metal into a short mould, generally watercooled. In this mould the metal film is continuously impacted to the shape of the desired product; billet, plate, strip, rod, rail, tube, wire, etc. A stand of rolls running at a synchronised speed continuously pulls the solid product out of the forming mould, giving it a reduction pass if desired. Depending on the products made, accessory equipment such as coilers, flying shears, cooling tables, etc., are also synchronised with the above equipment. The supercooled metal solidifies spontaneously upon impact without creating a liquid core in the formed product. As the major part of the heat content has been eliminated by the impact-casting machine, the mould has little heat to absorb and consequently does not erode, burn or check and can be short. The function of this mould is similar to a forging or extrusion die as it only shapes the plastic metal product while the latter travels to the pinch rolls. This action is

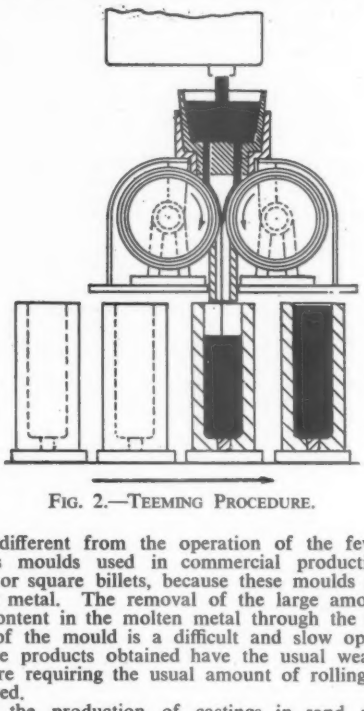

FIG. 2.—TEEMING PROCEDURE.

much different from the operation of the few continuous moulds used in commercial production of round or square billets, because these moulds receive molten metal. The removal of the large amount of heat content in the molten metal through the copper walls of the mould is a difficult and slow operation and the products obtained have the usual weak cast structure requiring the usual amount of rolling to be improved.

For the production of castings in sand moulds, conveyor or turntable equipment, as now in use, is necessary to carry and register the successive moulds under the impact-casting machine. Otherwise, the pouring is much the same, as pouring directly into the moulds. With supercooled metal no risers are needed, and most of the molten metal used can be turned out into good and sound castings.

Castings produced in metal dies or permanent

Film-Impact Process of Casting

moulds require a fast mechanical operation such as used in die-casting machines for closing and opening of the moulds and ejecting the castings. The supercooled metal does not erode or burn or check the dies whose life is considerably extended. Shells of ordinary steel or tool steel can be cast in metal moulds with less machining required than forgings, and at a rate of production many times faster than the fastest forging equipment now in use. For instance, with properly designed casting equipment, a continuous stream of molten steel of 2,000 lbs. per min. could be turned into shells ready to be machined with the physical properties easily meeting present specifications.

Two Installations in Brazil

Both the impact-casting machinery and the moulding equipment either for continuous-rolled shapes or castings made in moulds, are well adapted for continuous production. As a result, most efficient use of the process also requires a continuous source or supply of molten metal.

This condition industrially exists only to a limited extent. Melting furnaces for white metals such as aluminium, magnesium, zinc, lead and their alloys are capable of supplying molten metal continuously.

A continuous supply of molten iron is also available from so-called continuous cupolas and also from mixers used with blast furnaces. Most of the other melting furnaces are of the batch type. Some of these furnaces, such as induction furnaces used for brass melting, and high-frequency furnaces used for melting steel and alloy steel, also copper and nickel alloys, can easily be co-ordinated to supply molten metal to an impact-casting machine.

Two of the largest steel producers in Brazil are installing impacting casting machines for operating under this process. A view of a machine recently shipped to one of these concerns is shown in Fig. 1. These units are operated as follows: The stream of molten steel from the nozzle of the pouring ladle is directed continuously between the rolls, A, through the top funnel, B. The stream of molten metal is formed continuously into a film, propelled, supercooled and degassed by the action of the rolls and directed into the clamshell projector, C, shown beneath the baseplate. From this projector it comes out in the form of a circular stream of supercooled metal and is projected at high velocity into the receiving ingot mould. When the mould is filled the stopper is closed. Another mould is registered beneath and pouring continued (Fig. 2). Capacity of this particular machine is 7,000 lbs. of molten steel a minute, which is adequate for ingots of the largest size.

Open-hearth, Bessemer and arc furnaces, it is claimed, can be co-ordinated with a properly designed impact-casting machine, such as already built for Brazil, to impact-cast regular size ingots under usual schedule of operation. Heavy castings, such as rolls, housings, gears, big gun barrels, gun carriages, etc., also can be impact-cast to obtain the improved uniform crystal structure and physical properties. The output of these furnaces can be used to feed an impact-casting machine synchronised with continuous mould and pulling rolls to make continuous slabs, plates, billets or shapes such as rails. Furthermore, the film-forming method can be used to advantage to speed up the production and refining of steel and other metals.

Refines Steel Quickly

When used for the production of steel, molten iron from the mixers or from a continuous cupola and high enough in silicon is run through a film-refining machine. This machine forms the molten pig-iron into a thin continuous film in intimate contact with a film of molten slag (separately fused iron ore, or iron oxide with lime and flux) and ensures complete diffusion by forcing the lighter molten slag through the molten iron. This operation reduces and removes some phosphorus, all the silicon and manganese and all or some of the carbon of the pig-iron under the controlled temperatures of operation. This operation is continuous and machines can be designed to handle 1 to 3 tons per min. The material treated is immediately fed into a second similar machine which forms it into a thin film in intimate contact with another film of molten slag of the proper composition (calcium or other slag), which removes the remaining sulphur and phosphorus. Centrifugal action is used to separate the refined metal from the film of used slag and to prevent reversible action.

The refined steel is so clean that it can be run directly into an impact-casting machine or teemed into a ladle. Its composition can be adjusted by the addition of ferro-alloys either in lump or molten form. The chemistry is the same as in open-hearth practice.

Comparative Advantages of Process

The speed-up of the refining operations is due to the tremendous surfaces of reactions created under the process at controlled temperatures. Under these conditions the chemical reactions are instantaneous and, being mostly exothermic, no fuel is needed during the operation. This operation, the author concludes, has all the advantages of the Bessemer process in rapidity, economy of fuel and lack of human element in its control and will not advertise its presence by large flames illuminating the sky. Furthermore, and in contrast to the Bessemer operation, the weight of steel obtained is greater than the weight of pig-iron used, due to the incorporation of the Fe from the molten ore used in the reduction. Besides, the steel obtained is clean and the reduction of metalloids can be carried out much further than by present methods to secure pure iron. This pure iron can be used as a perfect base to make improved steel alloys, such as silicon steel for electrical uses, stainless steel, heat-resisting steel, etc., with a lower carbon content and freer from impurities.

This procedure can be used to refine steel after it is melted in present open-hearth or electric furnaces and applied to the refining of most other metals.

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EDUCATIONAL REFORM FROM AN INDUSTRIALIST'S VIEWPOINT*

By G. L. HARBACH

Over half a million children in this country leave school each year and most of them eventually find employment somewhere in the industrial field. This may be in mining, agriculture, transport, engineering, shipbuilding, textiles, building or the distributive trades, but, judging from many different angles, the educational system falls short of providing a suitable preparation for children to enter the various occupations associated with these industries. Fathers are all too often faced with the most important decision regarding their children's future; they are anxious to do their best for them, and are worried by the difficulties of choosing a career for them. Many applications for employment are received from boys who wish to be engineers, yet they have not the slightest idea of what engineering covers, or again just do not know what they wish to become. When the father approaches the school authorities for advice he discovers that they fail to appreciate the needs of industry and, with little knowledge of scope or prospects, the child often finds a job by a process of drift leading into anything that offers.

Obviously there are serious defects in a system which has control of children during their most formative period and finally allows most of them to enter, so ill prepared, the industries from which they must eventually earn a living. To a great extent this deficiency is due to the effects of tradition. Until recently the keynote of education was classical scholarship and a good education was confined to a narrow section of the community that could afford to regard it as an end in itself. With the development of industry and improved facilities for education, this traditional view has become somewhat modified, but the basic principle remains the same; it still caters mainly for the academic mind rather than meeting the needs of modern industry, whereas education for the majority should be regarded as a means to an end, that of earning a living.

This lack of vocational training in schools is realised, not only by fathers and craftsmen who have to teach apprentices, but by authorities in this country and also in the U.S.A., where the system is on less traditional lines and more vocationally conscious. Mr. F. B. Conant, president of Harvard University, wrote some time ago: "The changes required to provide adequately for those whose careers depend on an aptitude for book learning are relatively slight. Our schools must be concerned with educating for a useful life, not only the able scholar but the artisan and craftsman. They must nourish those whose eye or ear or manual dexterity is their greatest asset and develop the capacities of those who possess intuitive judgment on practical affairs but have little or no aptitude for learning through the printed page."

A few schools in this country are vocationally minded and educate children with a job as the end in view, including visits to factories and workshops for the more advanced scholars; some keep lists of employers' requirements and regard it as their responsibility to find posts suitable to the varying abilities of their pupils. However, all these represent the exception rather than the rule, but they do show the need for alterations in ordinary school curricula and provide examples of the kind of changes necessary.

Improved Post-War Education

The Minister of Education has given official recognition of the need for reform by proposing plans for improved post-war education. These include the encouragement of children to make their choice of a career at the age of 11 or 12, in order that their subsequent instruction may be specialised, and embrace three types of training. For artisans, black-coated workers, and those destined for an artistic or academic career. The Minister's proposals for improvement are praiseworthy, but their general application is very much the industrialists' concern, as they represent the trades and professions which will have to employ the scholars of the future. At present even the parents have difficulty in choosing a career for their children when these reach the age of 14 to 16 years. If, as the Minister suggests, the choice is to be made at the age of 11 or 12, then the present system of both the education and more particularly the development of individual aptitudes must be completely revised. From this, in the author's opinion, educational authorities and the teaching profession should become vocationally conscious and all education should be based on the principle that the majority of children will have to earn their livelihood and school curricula be arranged with that end in view right from the start.

Returning to the Minister's three groups, obviously the largest will be the potential artisans—the future operatives, foremen, technicians and executives in industry—and it is with the education of this group that industrialists should be most able and ready to help, both in advisory and practical ways, for they should know best what will be their ultimate requirements. Assuming the Minister is prepared to co-operate, it is suggested that each industry through its technical societies and associations—such as the Institute of British Foundrymen for the foundry and the Institution of Mechanical Engineers for mechanical engineering—should form national committees to advise on education as applied to their particular interests and that local societies, such as the Newark Engineering Society, should study the same problems from a regional aspect.

National Committees

The work of the national committees would cover advice and recommendations to the Minister of Education and the first step would be for each industry to compile a statement of its requirements as regards subjects to be taught for the various branches—productive, technical and administrative—with the scope and prospects in each branch and the standard of

(*Continued on page* 116.)

* Presidential Address delivered to a Joint Meeting of East Midlands Branch of the Institute of British Foundrymen and Newark Engineering Society.

PRACTICAL ECONOMIES IN THE USE OF COREBINDERS

High Temperature Tests—Starch Sand — Waterglass Experiments —Core Strength and Red Clay Additions Discussed

By A. TIPPER, M.Sc.(Eng.).

(*Continued from page 76.*)

DISCUSSION

The BRANCH-PRESIDENT (Mr. R. B. Templeton), speaking on the practical side of foundry work, said that the conditions varied so widely as between different foundries, and the types of core that had to be made were so many, that the particular difficulties of one foundry were not those of another. The acid test of a core was that it should make a good casting. The second point about a core was its resistance to thermal shock, but the author had not touched on that subject, although he probably would have done had he had more time. Therefore, it seemed from the practical point of view that the conditions were totally different when a wide variety of cores was being made—large, small and medium in numbers, amounting to 500 or 600—from those in a foundry where small cores only were being made. For that reason it was essential to ensure that the core resisted the conditions in the mould, and having once established that fact, the mixtures used should be based on that knowledge within the limits found suitable, from that very important characteristic, *viz.*, resistance to thermal shock.

It was also most important that the core should maintain accurate dimensions. The green strength for handling was very important. Testing cores at high temperatures had not been carried out to any great extent yet in this country. An essential feature was that the core should stand up to the heat when the molten metal was poured against it. He specially stressed the importance of testing at the higher temperatures, because from practical tests it had been found that in the case of the lower tensile strength mixtures, say 70 lbs. per sq. in., the castings produced were dirty and, on increasing the tensile strength to, say, 140 lbs. per sq. in., the cores were difficult to remove from the castings and, in some cases, the castings were cracked. This emphasised the importance of control of core strength, and his view on the question of mixtures and various compounds was that the limits should be set by actual shop practice and experience.

Core Jointing with Fusible Metals

MR. V. C. FAULKNER (Past-President) said it was obvious from the Paper that any large-scale experimentation in the actual foundries was not worth while. In so much as the manufacturers of core mixtures and oils possessed large well-equipped laboratories, it was better to leave the conduct of such research to them, provided they continued their policy of publishing their results. The more the manufacturers gave to the foundrymen in this way, the less foundrymen would be inclined to experiment for themselves. A question of some importance was whether it was economical in wartime to join half-cores by pinning with fusible metal. He had seen that system in use in large motor-car factories, both at home and abroad. For the reclamation of cores there was a method of cascading the sand, air suction being used to remove silt. That was probably the most popular method in the larger foundries, but so far as the jobbing foundry was concerned, he did not think the reclamation of sand was worth while.

High Temperature Tests

The AUTHOR said he thought the Branch-President had given them a great deal to think about. He entirely agreed with his views that actual shop practice was the yardstick by which to measure the type of mixture to suit a particular job, and the laboratory or control test could come later. The thermal shock resistance and properties at high temperature of core mixtures had been investigated to a limited extent in this country and America, but he could not give any real guidance on this matter. This seemed to him to be one of the problems still to be dealt with.

MR. FAULKNER said that, although the Americans had carried out experiments at high temperatures, they found difficulty in deciding upon the best size of test-piece upon which to standardise.

The AUTHOR said he regarded tests at high temperature as fundamental, and research should be made on core mixtures at high temperatures. The point to bear in mind, however, was that the conditions in any experiment of this nature must duplicate practice. If a small core was tested at high temperature, it just burned away. Most core-making materials lost all their strength at temperatures in the region of 300 to 400 deg. C. He was not in a position to say anything about the

jointing of cores. All he could say was that it was not in general use in this country, but he had seen the idea at Ford's works, and it might be copied if similar conditions applied, *i.e.*, making one core shell do double work by splitting the core in half and baking the bottom half in a shell. Then putting the top half green on to the dried bottom half. This enabled a very high output to be obtained with a very lightly bonded sand. In the Ford case he believed the sand was rammed by Sandslinger.

Starch Sand

MR. GENTLES asked if the author had had any experience of starch sand. He had been associated with a firm which used this for a considerable number of years, and it was then quite cheap. It was obtained from a local firm, which was one of the largest cereal firms in the country, and was a residue from starch. This was boiled not in direct contact, but through the medium of water jackets, and mixed with the sand, which was used continuously over and over again for some 17 or 18 years, and very little new sand was bought. It had a good strength.

The AUTHOR replied that he had used mixtures containing flour, which would be somewhat similar to what Mr. Gentles had mentioned, except, of course, that Mr. Gentles was producing a soluble material by the boiling process. However, ordinary commercial flour had very little value as to dry strength. He asked if the mixture mentioned by Mr. Gentles was used for core making.

MR. GENTLES said yes, entirely. The cores were made up to a weight probably of three tons a day, and they had a very good test in as much as they went into bases, and were completely surrounded by metal. Afterwards the castings were rattled by being hit with a crowbar, and the cores easily collapsed.

The AUTHOR said this rather indicated the possibility of reducing some of the mixtures that were at present used to a rather simpler form. He imagined that Mr. Gentles was originally using a natural bonded sand.

MR. GENTLES said that was so.

The AUTHOR added that what Mr. Gentles had mentioned was rather like present day practice, in which natural bonded sand was used in the first place with the addition of wood extract or molasses or a little dextrine. In certain light alloy foundries this type of mixture was used, and the sand was used over and over again for years, and very little addition was made to it.

Core-Dusting

MR. A. BOWMAN asked whether the author knew of the practice of dusting cores with powdered rosin. He had done this in the case of light castings, and it gave a perfect skin. It was easily applied and must be put on hot.

The AUTHOR said he knew it was used in this country, but he had not had any practical experience of it. It was similar to the practice of spraying with a solution of rosin or pitch used in some foundries, but it was necessary to find a suitable solvent. There were foundries where solutions of pitch or rosin, and in some cases just diluted linseed oil, were sprayed on for more or less the same purpose as that mentioned, and also to increase the hardness of the skin of the core.

Waterglass Experiments

MR. THOMAS asked if the author had done any work with waterglass, *i.e.*, sodium silicate. On one occasion he had been trying to cut out the objectionable fumes given off by an oil, and tried the experiment of spraying with waterglass, but there had been the difficulty that the core did not break down very easily. Perhaps he had used too strong a solution.

The AUTHOR said he had used waterglass, and if sufficient was used to produce what he called a reasonable dry strength, then there was the difficulty that the core did not break down, and he had not found any method of overcoming that. In considering the use of alternative materials, he regarded sodium silicate as a possibility. For green strength, where it was necessary to cut down any gas-forming materials, there were possibilities in using a mineral clay of high bonding value and selecting a type which would break down (*i.e.*, one which had a low dry-strength at high temperature), such as the red clays or bentonite, or possibly using powdered wood extract, provided sufficient was available. The difficulties of using waterglass were obvious, and he also had found a great difficulty in producing a satisfactory mixture. It tended to harden and caked up the mixer, and he did not think it could be used satisfactorily alone. Oil did not mix well with it, and it did not form a very easily worked mixture on the bench. For dry-strength he suggested they should aim at economising as far as possible in the use of seed oil by adulteration or by using other materials in solution, or by making use of the pitches and petroleum products, and possibly synthetic resins, which gave a very satisfactory dry strength. Another aspect of the question of substitutes was the use of by-products, such as sooty oils, linseed grease, or other oil residues which could be obtained from oil mills.

Economy in Corebinders

Semi-Permanent Cores

A SPEAKER remarked that the author had mentioned the possible use of semi-permanent core materials, and inquired what material he had in mind.

The AUTHOR replied that he had plaster of paris in mind, but only for certain simple types of core, where stripping was obviously easy, something after the same manner in which a steel or iron core could be used. There were quite a number of wartime products for which sand cores used to be employed, but which were now made with permanent mould and cores, *i.e.*, steel cores, and stripping took place very early after setting of the metal.

Core Strength

MR. A. AUGSTEIN agreed with the author's statement that the green strength was improved by using a higher percentage of binder, but his experience had shown that the dry strength did not increase after about 2½ per cent. of binder had been used. Actually he had found that with 1.8 per cent. of a suitable binder, even cores which require a high dry strength (say radiator cores) gave satisfactory results; they had a silky surface, so that no infiltration of the metal into the cores occurred, and the high permeability was also kept and all other properties of a good core were retained. In many cases very high green strength is unnecessary, especially where core-drying shells are used. A core compound should not be based on a high amount of cereals. Apart from the saving point of this valuable food product, these compounds need in their manufacture a high percentage of water, which causes a great many difficulties during casting. He suggested that the cereal content of a binder should not exceed 20 to 25 per cent. Dry silica sand should be employed. Additions of clay or naturally bonded sand should be kept as low as possible, as they decrease the permeability. Finally, he thought the main aim of the coreshops should not only be to make cores easily, but to assist in the production of sound castings.

Red Clay Additions

MR. MERCER said he had tried liquid red clay, but it was not found possible to break down the clay sufficiently. Excellent cores were obtained, but they could not be knocked out easily. Could the author suggest some means of breaking down red clay sufficiently for this purpose?

The AUTHOR asked what percentage of red clay was used and what were the other ingredients.

MR. MERCER said the other ingredients were sea sand and linseed oil, and there were two-thirds clay.

The AUTHOR said there was bound to be this difficulty with red clay owing to its high dry strength. If the amount of clay could be reduced to about 10 per cent., as a maximum, there would be much more chance of success. It might be possible to introduce something which would break down at very low temperatures, such as sawdust or wood extract, something which would lose its dry strength completely at high temperature. Most clays had appreciable strength at high temperatures, and one could either reduce the amount of clay used or break the core up by introducing a substance which would burn out.

Vote of Thanks

MR. GENTLES moved that a hearty vote of thanks be accorded to the author for a lecture which was so very nicely balanced between the practical side and the theoretical side.

MR. BURGESS, in seconding, said that foundry foremen were rather inclined to buy the commercial products and not trouble much about what they were made of. He asked the author if he could indicate something that would increase the green-bond strength in winter. Calcium chloride had been mentioned as good for the summer, and he presumed it was added in the mill and not made an emulsion with the oil, but it would be useful to know of something that would increase the green strength of cream oil core compound which had been giving trouble during the cold weather.

The AUTHOR, replying, said there were one or two other materials he had not mentioned which might help Mr. Burgess. To retard air drying there was sodium nitrite, as advocated by Mr. J. J. Sheehan, which was very successful in retarding air hardening, but, as regards increasing the green strength in winter time, it depended very much on the mixture that was being used. Did the mixture Mr. Burgess was referring to lose its green strength on standing?

MR. BURGESS said it lost green strength when standing on a wet day.

The AUTHOR said that was rather unusual, and the mixture must be a very critical one. He could only suggest that, if natural bond was not being used, a little bentonite should be added to the mixture, as this had a very wide moisture range. One should also bear in mind the necessity for balancing the dry strength, because, whatever oil was present, had its efficiency reduced to some extent by the introduction of fine clay. That was the only suggestion he could make at the moment.

American Metallurgical Scene—10

AMERICAN STEEL INGOT CAPACITY

NEW ESTIMATE BY W.P.B.

A review of the iron and steel expansion programme prepared by W. A. Hauck, head of the steel planning unit of the Iron and Steel Branch of the War Production Board, recommends a steel ingot capacity for the United States of 98,279,970 tons by mid-1943. This is 9,710,000 tons more than the 88,569,970 tons present rated capacity of the industry and represents a 10 per cent. reduction from the 10,762,000 tons originally approved following the authorisation of the Supply Priorities and Allocations Board on September 30, 1941. The review was made by the Branch and by representatives of the Army-Navy Munitions Board following the order of W.P.B. chairman, Donald M. Nelson, that all expansion programmes be carefully reviewed to save as much critical material as possible.

Completion of the recommended programme will raise pig-iron capacity from 59,406,410 net tons on December 31 last to 70,351,410 tons on June 30 next, electric steel capacity from 3,741,310 to 5,759,310 tons, Bessemer capacity unchanged at 6,721,400 tons, and open-hearth capacity from 78,107,260 to 85,799,260 net tons. The increase in open-hearth steel capacity will be obtained by three steps. New furnaces will provide 4,891,000 tons of the 7,692,000-ton increase; hot metal from blast furnaces, instead of cold scrap, will account for 2,163,000 tons, and restoring and enlarging old furnaces will bring in 638,000 tons.

Of the total increase in ingot capacity, 5,165,000 tons will be completed in 1942 and the additional 4,545,000 tons brought into production in the first six months of 1943. Many of the projects are well on their way to completion at present and some already are in operation. The report also calls for an even larger increase in raw materials facilities to make up for the reduced amount of purchased scrap expected next year and thereafter.

The 10,945,000-tons increase in pig-iron capacity is to be provided by 20 new blast furnaces (8,118,000 tons), by restoring six abandoned furnaces (1,235,000 tons), by the enlargement of nine existing furnaces (853,000 tons), by the use of sintered ore (599,000 tons), and by the use of thinner furnace linings (140,000 tons). This year will see the completion of 6,349,000 tons of this total, with the remaining 4,596,000 to be completed in 1943. Completion of the pig-iron programme will make 70,351,410 tons available, with 9,500,000 tons necessary for merchant iron and ferro-alloys. This leaves 60,851,410 tons available for steelmaking.

Full use of the entire 98 million tons of steel capacity will require 109,463,223 tons of metallics, made up as follows:—Pig-iron, 60,851,410 tons; plant scrap, 26,828,607; metal in ore, 5,834,400; and purchased scrap, 16,000,000 tons. In addition to the steel expansion programme, the report also lists a 70 per cent. increase in steel foundry facilities to make vital war castings.

Ingot capacity of 98 million tons, the report points out, will provide 68,796,000 tons a year of finished steel products. These may be distributed as the needs of the war determine, as finishing facilities are approximately 30 per cent. higher than metallic capacity. Present finished products capacity is approximately 62,098,979 tons.

CONSERVATION OF MANGANESE

The American Iron and Steel Institute recently appointed a Committee of six under the chairmanship of C. H. Herty to consider how manganese may be conserved should the supply become restricted. For the purpose of their report the Committee decided to subdivide steel products into three classes, namely: Class A, products in which the manganese content of steel can be reduced with little or no effect on the production rate or quality of the steel; Class B, products in which the manganese content may be reduced with a probable adverse effect on both production and quality; and Class C, products in which, if the manganese contents were reduced, definite effects on both the production rate and quality of the steel would be expected.

Many products are considered individually in extracts of the report published in "Metal Progress," but, in summary, the Committee believe that if the supply situation becomes critical, the plan outlined below should be followed:—

(1) As a first step, the manganese content of steels falling in Class A could be reduced. This class includes high manganese sheet steel, some of the commercial high manganese steel rails, bars, much of the sheet and strip steel plates, and other products. It is expected that 10 per cent. of the total ferro-manganese can be saved by this procedure.

(2) As a second step, to be taken only if the need is great enough to warrant an adverse effect on production and quality, the manganese content in the Class B steels could be reduced. This class includes tinplate, some grades of tubing, rods, wire, sheet and strip. It is expected that another saving of 10 per cent. of the total ferro-manganese can be so made by this procedure.

(3) Any action to reduce the manganese content in steel products should be taken only after careful thought by producer and consumer.

War Plant Building

War plant building in America is running at a rate of about $12,500,000,000 a year, estimates the W.P.B. A further increase in building is expected to send the total past the $13,500,000,000 mark by the end of the year, topping by 20 per cent. the total construction for 1941, when an all-time record was set. Last year non-essential civilian construction amounted to about $4,000,000,000 and has been falling off sharply since that time. This year such construction will total less than $650,000,000.

THE MERIT BONUS SCHEME*

By A. H. Squire

Merit bonus should be based on the relation between total production cost and net profit. Total cost because there is then an incentive to work the most economical way. When bonus is paid on wages to output ratio there is likely to be excessive waste of material.

The merit bonus scheme aims at paying workers according to their ability and they should be divided into five grades as follows:—

Grade 1.—First-class workmen capable of thinking for themselves and of doing good work quickly.

Grade 2.—Men who can do a first-class job. An average job in a fast time. (Above the average.)

Grade 3.—Men who can do a good job in a fair time or a rough job quickly. (Men of average ability.)

Grade 4.—Men who do an average job rather slowly, a rough job in a fair time, etc. (They are useful at busy times.)

Grade 5.—Men who have made no progress since they were boys. No efficient firm would employ them.

Bonus is paid to these five grades of labour as follows: Grade 1, 6 units; 2, 4 units; 3, 2 units; 4, 1 unit; and Grade 5, no bonus (bare rate). To initiate the scheme take the existing total bonus, or with pieceworkers, the earnings over day work, as a basis, together with production cost figures (wages and material), net profit, and use these figures as a basis. If only day-work money has been paid the management must decide whether the men have generally been working at a bonus speed and pay a figure according to their assessment, or if the men have been working at "day-work speed" with plenty in reserve, a zero figure will be used for basic calculations.

After operating the scheme, efficiency should increase, costs reduce and profits rise, therefore bonus will increase in proportion. To determine each man's share in the bonus, paid as a percentage of salary, study the following table and apply it to the list of workers (staff, operators, etc.), *e.g.*, if a firm employs 100 men graded as follows:—

	Men.	Units per Man.	Total Units
Grade 1 ..	20	6	120
„ 2 ..	25	4	100
„ 3 ..	30	2	60
„ 4 ..	15	1	15
„ 5 ..	10	—	—
	Men 100		Units 295

Under ordinary bonus conditions, assume each man to get an increase of 33⅓ per cent. on his basic wage and war bonus. Thus, if a man's wage were £5 per week, he would get £6 13s. 4d. in all, irrespective of his real value to the firm, but under merit bonus conditions, things would be different, although the cost to the firm would be the same.

100 men at average wage of £5 p.w. = £500.

33⅓ per cent. bonus = £166 13s. 4d.

$$\therefore \frac{\text{£166 13s. 4d. (Bonus)}}{295 \text{ (Units)}} = \text{11s. 3½d. per unit.}$$

	Units.	Wage.	Bonus.	Total.
		£	£ s. d.	£ s. d.
Grade 1 ..	6	5	3 7 9	8 7 9
„ 2 ..	4	5	2 5 2	7 5 2
„ 3 ..	2	5	1 2 7	6 2 7
„ 4 ..	1	5	0 11 3½	5 11 3½
„ 5 ..	—	5	Nil	5 0 0

Surely this scheme, which attempts to take into account all the essentials of collective effort and at the same time, the payment-by-results affair is worthy of development and standardisation in the industry in preference to the various schemes at present operating, with the anomalies of piecework and bad rate-fixing. The grading of operators must be done by the foremen, it must be done fairly and systematically and not by guesswork (although much guessing can be very near the mark).

By drawing up a special form for each trade, setting out the various qualities needed, the work is easy. Points are awarded for each quality, the maximum total to be 100. Thus the number of points a man is awarded will be his efficiency percentage, this being applied to the following percentage scale indicates the man's grade: Grade 1, 90 to 100 per cent.; 2, 76 to 89; 3, 51 to 75; 4, 31 to 50; and Grade 5, 0 to 30 per cent.

Experiments have shown that the percentage range to each grade takes care of the human element in assessing a man's value and combined with the grading form gives the assessor an opportunity to give the men a square deal, while the fact that total bonus paid is unaffected by grading puts it beyond the power of anyone to save the firm's money by dishonestly rating a man below his ability, indeed the chances of dishonesty are no greater than exist under piecework conditions. Beyond this statement the question of dishonesty is disregarded as in the writer's opinion there is no room for dishonest people in the British foundry industry.

Considering the assessment of each man, taking the case of the patternmaker as an example. (1) His time-keeping may be perfect, good, average or bad. (2) Conduct will probably be "average," he may be a man who sets a "good tone" in the shop by his example, he may be a quarrelsome fellow. This must be allowed for. (3) He must be able to read drawings quickly and to visualise the job. (4) He must be capable of accurately setting out the job. (5) He must be able to plan the method of moulding and the design and construction of pattern equipment. (6) His workmanship must be good; and (7) his speed must be considered.

Timekeeping and conduct are qualities common to all workers, and it should be noted that while the

* Extracted from the winning entry of the Essay Competition on The Future of the Foundry Industry in Great Britain, organised by the Institute of British Foundrymen.

The Merit Bonus Scheme

"average" marks are nil, in each case, provision is made for "Plus 5" or "Minus 10."

The reason is that a man whose conduct or timekeeping is outstandingly good should be considered just that much above the average, whereas a man who is that much consistently below standard can offset any other qualities he has by his bad example.

	Minimum.	Maximum.
Timekeeping ..	.. — 10	+ 5
Conduct	.. — 10	+ 5
Reading drawings	.. —	18
Setting out ..	.. —	18
Planning	.. —	18
Workmanship ..	.. —	18
Speed	.. —	18
Possible total	.. ..	.. 100 per cent.

It should be easy for trade experts to devise grading charts similar to the foregoing example for any trade. They should be filled in and filed by the shop foreman, and if a number of columns be provided the men's value may be checked at any future date; indeed, it is a good thing regularly to do this in order that any falling off in the man's work may be accounted for; the reason found and corrected or any improvement be credited when he makes a higher grade, although it is most likely that the men will look after this side for themselves: Bill Smith will argue that he is as good as Jones and "what about it?" This is the healthy line of thought to encourage; a man who is interested in his ability is going to find out "why?" and when a man's pocket is affected he rarely fails to show some interest.

Show the man both charts, and by comparison indicate his weaker points. Supposing Jones is rated at 77 per cent. and just qualifies for Grade 2, while Smith's rating is 70 per cent. and he is thus Grade 3 on account of the line of demarcation which must be strictly observed if the scheme is to be effective. The effect, if the man is given helpful criticism, will be for him to make real effort to earn the extra 7 points, possibly by taking his job more seriously and improving his skill at planning; this will undoubtedly increase his speed, and what is more important to him, double his previous bonus. The scheme provides an incentive to individual improvement.

By coupling the total bonus payment with total cost and net profit, the urge towards economical production is encouraged, and by including all members of the staff (and why not rope in the travellers and salesmen, with quotas set against percentages, and end the anomaly of the man who sells the goods getting many times as much as the man who produces them) participating in the scheme a real unity of endeavour is encouraged, and the "passengers" will cease to set the pace of the factory.

COMPANY NEWS

(Figures for previous year in brackets.)

Oxley Engineering—Dividend of 12½% (same).

Wombwell Foundry & Engineering—Dividend of 12½%.

William Beardmore—Interim ordinary dividend of 3% (same).

Horseley Bridge & Thomas Piggott—Dividend of 12½% (same).

Colvilles—Interim dividend on the ordinary shares of 3% (same).

Churchill Machine Tool—Interim ordinary dividend of 15% (same).

G. D. Peters—Interim dividend of 7½% on the ordinary shares (same).

Cochran & Company, Annan—Final dividend of 2½%, making 4% (same).

Manganese Bronze & Brass—Interim dividend on the ordinary shares of 7½% (same).

Thos. Firth & John Brown—Interim ordinary dividend of 4½%, tax free (same).

C. Akrill—Net profit for 1941, £9,865 (£9,517); dividend of 15% (same); forward, £21,951 (£17,942).

Incandescent Heat Company—Net profit for 1941 of £7,155 (£7,008), after taxation £11,000 and depreciation £2,127.

Indian Iron & Steel Company—Further dividend of 15%, free of Indian income-tax, for the year ended March 31, making 22½% (same).

Lancashire Steel Corporation—Half-yearly dividend on the 5% cumulative redeemable first preference shares for the six months to October 31.

Renold & Coventry Chain—Net profit for the year ended June 28, after taxation, £100,739 (£93,404); final ordinary dividend of 7%, making 10% (same).

Barton & Sons—Net profit for 1941, £42,808 (£26,515); dividend on the ordinary stock of 6% (5%); to capital redemption fund, £2,227; forward, after preference dividend, £9,810.

Zinc Corporation—Participating dividend of 5% (6¼%) on the preference and 10% (12½%) on the ordinary shares, making 30% (32½%) on the preference and 20% (25%) on the ordinary shares for 1941.

J. Blakeborough & Sons—Profit for the year ended June 30, £133,062; tax provision, £103,000; net profit, £18,346 (£19,504); pensions, £5,000; dividend on the 5% preference shares, £2,690 (£2,892); final dividend of 5% and a bonus of 10%, making 20% (same), on the ordinary shares; forward, £10,276 (£11,320).

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Walden Engineering Company, 251, Moorfields, Sheffield—£1,000. M. Waldenberg and M. V. Jackson.

Redler Equipment—To acquire the issued share capital of Redler Conveyors, Limited. £110,000. E. H. Wiseman, 8, Severn Avenue, Gidea Park, Essex, subscriber.

STANTON *Dale* REFINED PIG IRON

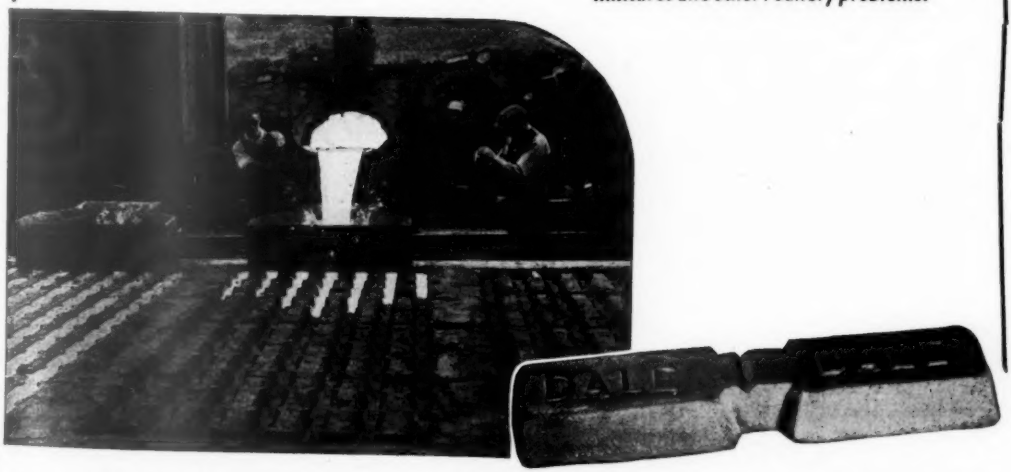
IS CHARACTERISED by closeness of grain structure, uniformity of composition and fine graphitic carbon evenly distributed.

IS PRODUCED to guaranteed analysis in seven standard grades.

CAN BE MADE to customers' individual requirements with total carbon from 2·6 per cent. upwards.

SHOULD BE USED to tone up high phosphorus irons and scrap, to replace Hematite, and to produce castings for all high duty purposes.

Users are invited to avail themselves of the Stanton Technical Service which offers free expert advice on special mixtures and other Foundry problems.



THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM

NEWS IN BRIEF

DURING THE R.A.F. raids on Düsseldorf on the nights of July 31 and August 1 a large part of the Schiess-Defries engineering plant was destroyed. This factory was the most important heavy machine-tool works in Germany.

MR. WALTER ARNOLD BLACKBURN, 29, Broadway North, Walsall, retired ironfounder, is paying a first and final dividend of 20s. in the £, payable at the Official Receiver's office, Somerset House, 37, Temple Street, Birmingham, 2.

FROM TIME TO TIME experts who examine crashed German 'planes come across ersatz materials. In a broadcast to Europe recently, Lord Selborne, Minister of Economic Warfare, stated that the last crashed German bomber to be examined contained no nickel and was 10 per cent. weaker in tensile strength than earlier types.

CONGRATULATIONS ARE DUE to the Borough Polytechnic on attaining its jubilee. It caters for a normal student strength of 6,000, to whom it teaches a particularly wide range of subjects from paint-making to bread-baking. The principal since 1933 is Dr. Douglas H. Ingall, who is well known for the sterling work he did when principal of the Constantine Technical College, Middlesbrough, in connection with the training of foundry students.

THE COMMISSIONERS of Customs and Excise have issued Public Notice No. 78 (Liability), among other notices relating to purchase tax. Notice No. 78 supersedes the September, 1941, edition; the relevant supplementary notes contained in the March, 1942, supplement; Notice No. 81 (April, 1942); and all additions and amendments thereto published up to September 15, 1942. The notices are issued from the Secretaries' Office, Customs and Excise, City Gate House, Finsbury Square, London, E.C.2.

MR. WM. WILLIAMS, a director of Williams Alexandra Foundry, Limited, Cardiff, is to be the chairman of Alexandra Furnaces, Limited, East Moors Road, Cardiff, a company which has been formed for the purpose of manufacturing the "Sklenar" patent reverberatory tilting furnaces. These well-known furnaces were at one time made in this country by British Reverberatory Furnaces, Limited, a company which was liquidated some years ago, when the patent rights were taken over by Mr. W. F. Sklenar, who has joined the board of Alexandra Furnaces, Limited.

AN INDUSTRIAL LIGHTING exhibition was opened at the demonstration rooms of the E.L.M.A. Lighting Service Bureau of Scotland, 29, St. Vincent Place, Glasgow, C.1., last week, in order to meet the demand for practical demonstration of lighting in factories. The exhibition provides an opportunity of inspecting the 80-watt 5-ft. fluorescent tubular lamp in actual service, while, apart from this interesting lamp, the demonstrations include all other forms of electric discharge and tungsten filament lamps which can produce lighting levels ranging from a fraction of a ft.-candle to very nearly 100 ft.-candles in the most economical manner.

OBITUARY

MR. BERNHARD S. HARLOW, principal of Robert Harlow & Son, Limited, engineers, Stockport, died on September 26, in his 75th year.

MR. HARRY NORMANTON, managing director of Graham & Normanton, Limited, machine tool makers, of Halifax, died on September 25 at his home in Halifax.

MR. J. T. T. BRUNSKILL, who has died at his home at Jesmond, Newcastle-upon-Tyne, had been connected for over 50 years with Guest, Keen & Nettlefolds, Limited, at their Newcastle branch. He was 84 years of age.

MR. JOHN W. BINGHAM, who has died, aged 69, at his home in Sheffield, was a director and works manager of the Sheffield Forge & Rolling Mills Company, Limited, with which company he had been associated for 37 years. He joined the firm as a sheet roller.

MR. HARRINGTON FARMER, who died at Castle Gresley, Burton-on-Trent, on September 15 at the age of 87, founded the original works of Farmer Bros., engineers and founders, Station Road, Gresley, in 1876. Later he took up a position with Mansfield Bros., Limited, at Church Gresley and was works manager for many years.

MR. FRED GARDINER MARTIN, of Stedman, Crowther & Company, Limited, non-ferrous metal merchants, London, died recently at the age of 71. He joined the firm at an early age and in 1911, on the death of Mr. Stedman, became a partner. He was elected to the Committee of the London Metal Exchange in 1915, and served without a break until 1927. During this period he became sole partner in the firm upon Mr. Crowther's retirement. In 1932 he entered the manufacturing side of the trade, and was largely responsible for the founding of British Lead Mills, Limited, of which he was the general manager and a director until ill health forced him to retire in 1941.

INTERCHANGE OF PATENT RIGHTS

A White Paper just published gives the text of an agreement between the British and United States Governments concerning the interchange of patent rights and information.

The agreement provides that each Government, in so far as it may lawfully do so, will procure and make available to the other Government for use in war production patent rights, information, inventions, designs, or processes, requested by the other Government. Each Government will bear the cost of obtaining these patent rights from its own nationals, and all patent rights so acquired are to be used for the purposes of, and until, the termination of the war. When the information or invention is of a category for which the other Government requests secrecy upon security grounds, each Government will take steps to ensure the appropriate degree of secrecy in manufacture and use.

WHAT HAS LIGHTING TO DO WITH FIGHTING ?

WITHOUT CORRECT LIGHTING IN THE FACTORIES THAT SUPPLY THE SERVICES, OUTPUT MUST SUFFER. Good lighting, so closely allied to production and the welfare of workers, is vital. If your installation needs better planning — or changes are required here and there to take care of new processes — or extensions are necessary — consult the G.E.C. Take advantage of the knowledge G.E.C. lighting specialists have gained in helping wartime factories towards full production.

Consult the G.E.C.

FOR ANY STANDARD OF ILLUMINATION

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PERSONAL

MR. WESLEY LAMBERT has changed his wartime address to 6, King's Avenue, Parkstone, Dorset.

MR. R. F. MAIR has been appointed secretary of the Edison Swan Electric Company, Limited, and of Edison Swan Cables, Limited.

MAJOR HAROLD H. PARKES, of E. Parkes & Company, Limited, of West Bromwich, has been elected chairman of the Midland Iron and Steel Wages Board to succeed Col. J. S. Trinham, who has resigned for business reasons.

MR. ALEXANDER S. MACLELLAN, of Alexander Stephen & Sons, Limited, Linthouse, Glasgow, has been appointed representative of the North West Engineering Trades Employers' Association on the directorate of the Glasgow Chamber of Commerce.

COL. JAMES S. TRINHAM has found it necessary to resign the chairmanship of the Midland Iron and Steel Wages Board. He has been a member of the Board for 32 years and for the past eight years its chairman. Combining wide industrial experience with sound commercial ability, Col. Trinham rendered valuable services to the Board. These are strenuous times, particularly for those engaged in the heavy industries, and Col. Trinham felt that he could no longer do full justice to the onerous and responsible position of chairman of the Board and at the same time attend to his more immediate duties in connection with the directorship of N. Hingley & Sons, Limited, and some of its subsidiary companies. For a like reason he has resigned his connection with the Council of the Wages Associations (a branch of the activities of the British Iron and Steel Federation).

Wills

TURTON, W. F., Smethwick, ironfounder...	£47,507
SUMNER, L., of Prestwich, formerly chairman of the Broughton Copper Company, Limited ...	£368,252

EIRE FOUNDRIES' SCRAP SUPPLIES

Unless more scrap metal comes along quickly, Eire may lose all its skilled metal workers. Already many ironfoundries have had to pay off skilled men, almost all of whom have emigrated to Britain. In an interview, Mr. Maurice Nugent, director of the Hammond Lane Metal Company, Limited, prophesied even further reductions in staff. "We are struggling to keep our men working," he said, "but unless we get more scrap, we will not be able to do so." Stoves and fireplaces—the bread and butter of any light foundry—will have to be produced on a very much reduced scale, together with many other articles. A national salvage campaign is suggested by Mr. Nugent as one way to relieve the raw-material situation.

G.E.C. Price Variations

The G.E.C. Price Variation Sheet No. 9, dated October 1, 1942, has been published for the use of the electrical industry. It supersedes Sheet No. 8 of February 1, 1942, and covers many of the company's products. Copies of this publication are available upon request to the company, Magnet House, Kingsway, London, W.C.2.

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

547,567 PINOFF, F. M. Weighing apparatus suitable for the weighing of molten metal or other material.

547,573 STURTEVANT ENGINEERING COMPANY, LIMITED, and DAVIES, A. B. Dust-collecting apparatus for mould boxes.

547,582 BAKER & FINNEMORE, LIMITED, BARNWELL, E., TYERS, L., and PALSER, J. Muffles or furnaces for the heat-treatment of metals.

547,584 INTERNATIONAL ALLOYS, LIMITED, PRYTHERCH, W. E., NEWELL & COMPANY, LIMITED, E., and HOWDEN, P. Metallurgical furnaces.

547,597 MUIR, W. P. Method and apparatus for forging billets.

547,614-5 HERBERT, LIMITED, A., and JACKSON, R. Systems for the supply of carburetted air.

547,641 E.M.B. COMPANY, LIMITED, CATLIN, L. A., and COCKERILL, W. H. Pneumatically-operated die-casting machines.

NEW TRADE MARKS

The following applications to register trade marks appear in the "Trade Marks Journal":—

"LUCOL"—Rotary wire brushes. A. LUSON & SONS, LIMITED, Standard Road, Park Royal Road, London, N.W.10.

"HOLVEC"—Firegrates, fireplaces, fireplace surrounds, and stoves. H. & G. THYNNE, LIMITED, Holmer, Hereford.

"EXPRESS"—Anti-friction non-ferrous metal alloys. WHITEMETAL SMELTING COMPANY PERDECK & SON, Abbey Mills, Waltham Abbey, Essex.

"TECHNITE"—Hand tools. CAPEWELL MANUFACTURING COMPANY, c/o Mewburn, Ellis & Company, 70 and 72, Chancery Lane, London, W.C.2.

"AMALGALINE"—Common metal for use in soldering, etc. GEORGE JENNINGS (LAMBETH), LIMITED, 3, Princes Street, Hanover Square, London, W.1.

WAR RISKS INSURANCE

The Board of Trade have reason to believe that a number of traders and firms who are required to insure their stocks or equipment under Part II of the War Risks Insurance Act, 1939, or Part II of the War Damage Act, 1941, as the case may be, are failing to comply with their statutory obligations by either not insuring at all or insuring for a sum considerably short of the full value for which the law requires them to insure.

A number of prosecutions have recently been instituted by the Board against persons who have failed to comply with their obligations, and traders are warned that the Board will not hesitate to enforce the provisions in question wherever necessary.

How much will **HEAT LOSSES** *claim*

The advantages of insulation include :—

- **Conservation of Fuel.**
- **Working Heat attained in less time.**
- **More Even Heat Distribution.**
- **Improved Control of Temperature.**

Efficient insulation can permit greater output — lower production costs — improved furnace control and better operating conditions.

THE production and importation of fuel is a grim business. "Austerity" demands the utmost economy in its use in all industrial furnaces and heat-generating plants. Avoidable heat losses must be stopped. This implies that wherever insulation is applicable, an efficient system should be installed as quickly as possible. General Refractories' "Amberlite" range covers the requirements of every industry and large quantities of materials are available from stock. G.R. insulation specialists are always ready to assist users in the choice of materials to meet particular conditions of service.

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G.P.159

Raw Material Markets

IRON AND STEEL

The iron and steel industry is entering upon the fourth quarter of the year with the prospect of continued activity in all sections catering for the needs of the war machine. Order-books at the producing works are filled to capacity, while replacement orders are readily available. Supplies of iron and steel, on the whole, are being despatched from the producing works satisfactorily. In the foundry trade the makers of heavy castings are busily employed, as the demand for large castings from the various Government departments keeps them fully occupied. Foundries producing light castings, however, are still quietly engaged and many of them will be closed for the duration of the war under the plans instituted by the Government for the concentration of industries which have surplus capacity. A start has already been made in this direction and the process is being tackled on an area basis. In pre-war days, of course, the light foundry trade did a large amount of business with the building industry, but much of this has vanished, as the building industry itself has been subjected to far-reaching control by the Government and is now, generally speaking, only permitted to cater for the requirements of Government departments and important constructions in other spheres. Light-castings makers have also been hard hit by the disappearance of the export trade, which was formerly a substantial source of business.

Supplies of hematite, low-phosphorus iron and other better quality irons do not improve, as the ores used in their manufacture have to be brought to this country from overseas and, among other things, there is not the requisite volume of shipping available for cargoes of this nature to enable imports to be made on a normal scale. This situation has been overcome generally by the utilisation of high-phosphorus and refined irons and steel scrap, irons of better quality being conserved for important contracts for which alternative grades are unavailable.

There is no shortage of coke for foundry purposes and many consumers are in the fortunate position of having appreciable stocks at their command. The coke ovens are able to make prompt despatches, so that users having limited storage accommodation are not inconvenienced. For delivery to Birmingham and Black Country stations, the current price of Durham best foundry fuel is 69s. 3d. per ton. As this quotation is subject to revision by the Control authorities, all contracts contain a rise-and-fall clause which covers both buyer and seller against loss.

Carbon and alloy grades of steel are in very great request at the munition and aircraft works, etc. Although outputs of these qualities have been considerably enlarged, still greater expansion is planned and there is no doubt that increased supplies would be promptly absorbed. Deliveries at the present time seem to be quite steady. Steel plates are under constant call, while demand for angles, joists, channels, etc., is increasing. The heavy industries, such as the shipyards, tank and wagon works, are in the market for very big supplies of plates, which are likely to remain in brisk request for a long time to come. Special grades of sheets are being called for at a brisk rate and the sheet mills are operating steadily.

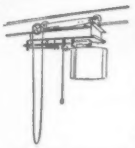
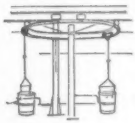
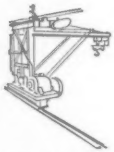
NON-FERROUS METALS

In a written reply to Mr. W. P. Spens, K.C., who asked the Chancellor of the Exchequer whether he was prepared to extend the provisions of Section 31 of the Finance Act, 1941, so as to give relief from excess profits tax to metal-mining concerns which, in order to accelerate output, had departed from normal mining practice by concentrating on the production of high-grade ores and, therefore, would incur increased costs in the post-war period, Sir Kingsley Wood stated that a concession on 100 per cent. E.P.T. was to be granted to these mines. The relief contemplated would ordinarily proceed, in principle, on the basis of allowing the higher costs that would have been incurred if the increase in output had been obtained by normal mining methods. It would be measured by reference to the increase in the metal yield of the ore produced, the expenses allowable being increased in that proportion. He proposed to include a provision in next year's Finance Bill, giving that relief for all accounting periods subject to the 100 per cent. excess profits tax.

While satisfactory quantities of copper are being delivered to war factories and other priority consumers, there are delays at times in supplies of extruded brass rods. The Control authorities are understood to be giving special attention to the matter and have introduced new methods for the acquisition of these products. Major Cottrell, representative in Turkey of the U.K. Commercial Corporation, is reported to have signed contracts for Turkish products which include larger quantities of copper than those bought last year. This announcement seems to have been taken as an indication that the supply of Turkish copper will make a material contribution towards the needs of British consumers, but, while the amount may be larger than that of last year, it is unlikely to be really substantial, as copper output in Turkey is limited.

A Washington announcement states that, with the aim of diverting mining man-power to the production of copper, lead and zinc, which are urgently needed for war purposes, production in many of the nation's principal gold mines is to be cut off. In Canada some 2,700 gold miners are being transferred to base-metal production, it is understood.

High-grade and electrolytic brands of spelter are being called for in very large tonnages by makers of shell cases and small arms ammunition, etc., while the G.O.B. descriptions are being used extensively by manufacturers of fuse rods and similar products. Domestic production of spelter is at a high level, and the full output is quickly passed into consumption.

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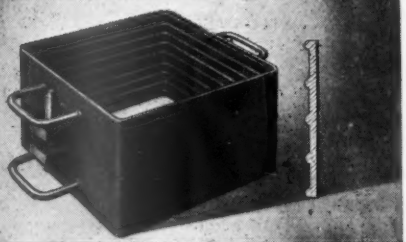

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